

MT23P02N2

P-Channel Enhancement Mode Field Effect Transistor

Product Summary

- $V_{DS} = -20V$
- $I_D = -17A$
- $R_{DS(ON)} = 15m\Omega @ V_{GS} = -4.5V$
- $R_{DS(ON)} = 21m\Omega @ V_{GS} = -2.5V$

Features

- Low Gate Charge
- Excellent $R_{DS(ON)}$
- Fast Switching Speed

Applications

- Load Switch
- PWM Application
- Power Management

Mechanical Data

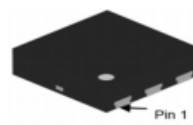
- Case: DFN2020-6L
- Case Material: "Green" Molding Compound.
UL-Flammability Classification Rating 94V-0.



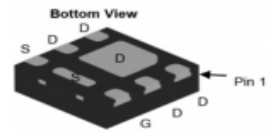
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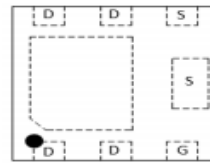
DFN2020-6L



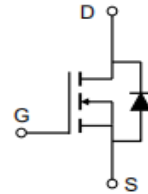
Top View



Bottom View



Top View
Pin Configuration



Device Symbol

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	-17	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	-60	A
Maximum Power Dissipation	P_D	2.6	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Resistance Ratings

Symbol	Parameter	Typical	Maximum	Unit
R_{thJA}	Maximum Junction-to-Ambient ¹	$t \leq 10$ Sec	20	$^\circ C/W$
		Steady State	45	

Notes:

1. Surface Mounted on 1" x 1" FR4 Board.
2. Pulse width limited by maximum junction temperature.

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-12\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.4	-0.68	-1.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-10\text{A}$		1.1	1.5	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-5\text{A}$		1.5	2.1	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-5\text{A}$		60		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		-0.59	-1	V
I_S	Maximum Body-Diode Continuous Current				-7	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-6\text{V}$, $f=1\text{MHz}$		1979		pF
C_{oss}	Output Capacitance			213		pF
C_{rss}	Reverse Transfer Capacitance			180		pF
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-6\text{V}$, $I_D=-8\text{A}$		16		nC
Q_{gs}	Gate Source Charge			4		nC
Q_{gd}	Gate Drain Charge			3.0		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-4.5\text{V}$, $V_{DS}=-6\text{V}$, $R_L=0.5\Omega$, $R_{GEN}=3\Omega$		8		ns
t_r	Turn-On Rise Time			35		ns
$t_{D(off)}$	Turn-Off Delay Time			71		ns
t_f	Turn-Off Fall Time			70		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		10		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

Typical Characteristics (@ $T_J = 25^\circ\text{C}$, unless otherwise specified.)

Figure 1: Output Characteristics

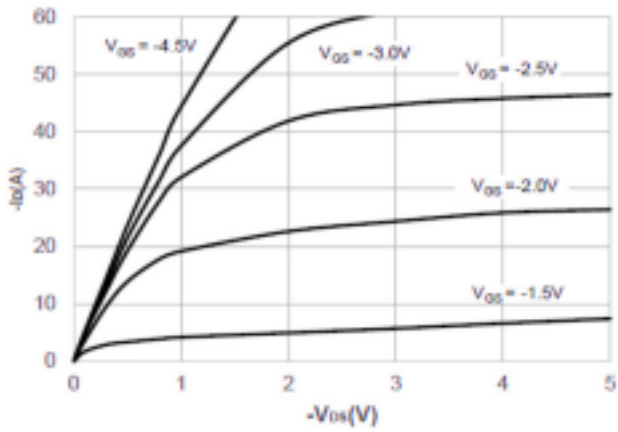


Figure 2: Typical Transfer Characteristics

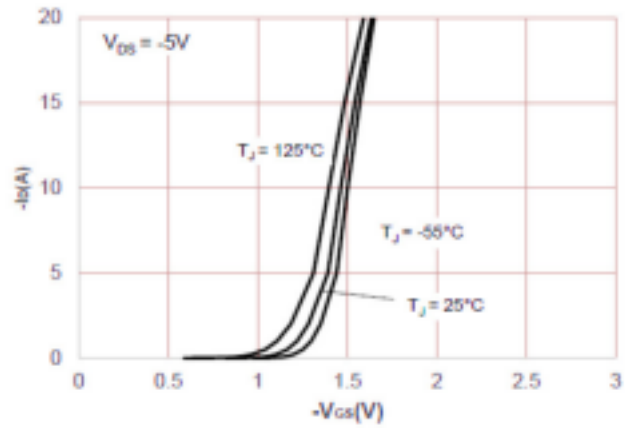


Figure 3: On-resistance vs. Drain Current

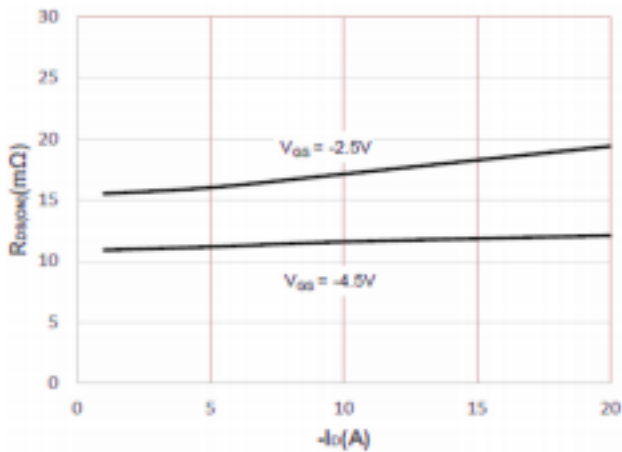


Figure 4: Body Diode Characteristics

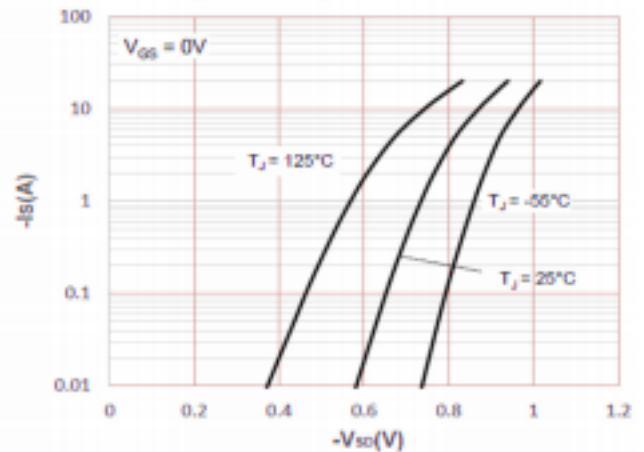


Figure 5: Gate Charge Characteristics

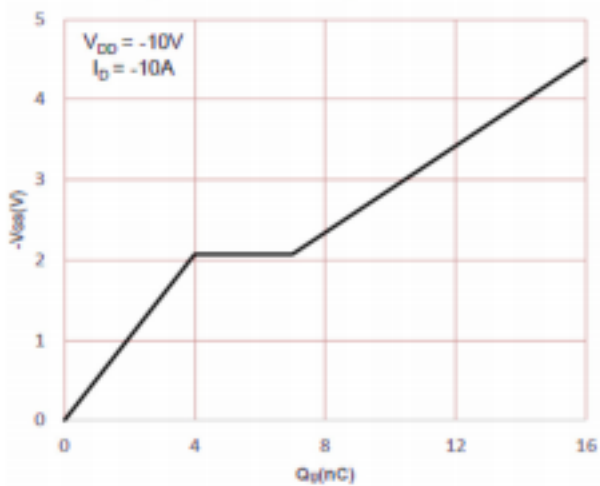
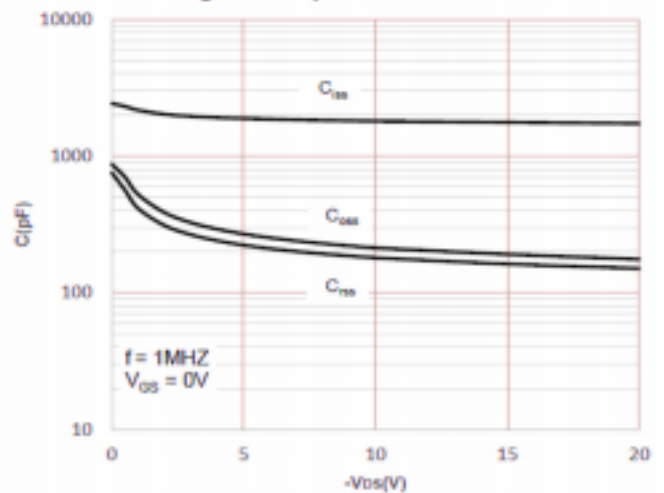


Figure 6: Capacitance Characteristics



Typical Characteristics (@ $T_j = 25^\circ\text{C}$, unless otherwise specified.)

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

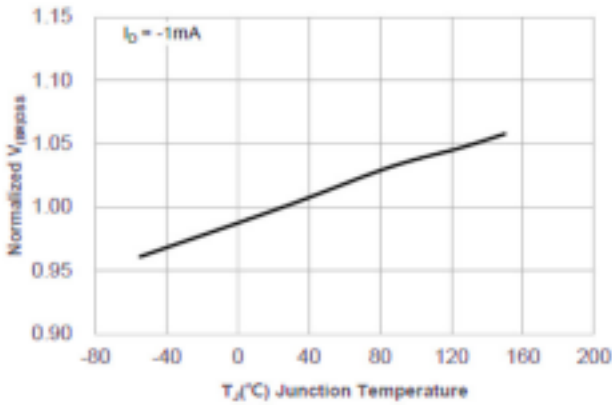


Figure 8: Normalized on Resistance vs. Junction Temperature

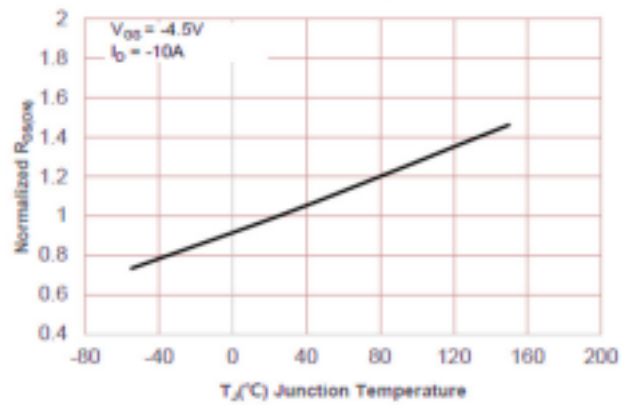


Figure 9: Maximum Safe Operating Area

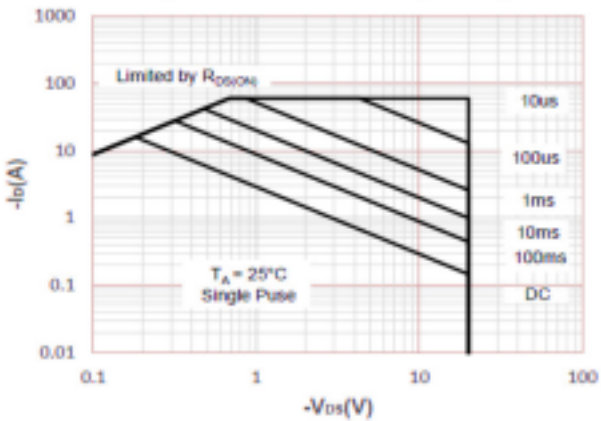


Figure 10: Maximum Continuous Driant Current vs. Ambient Temperature

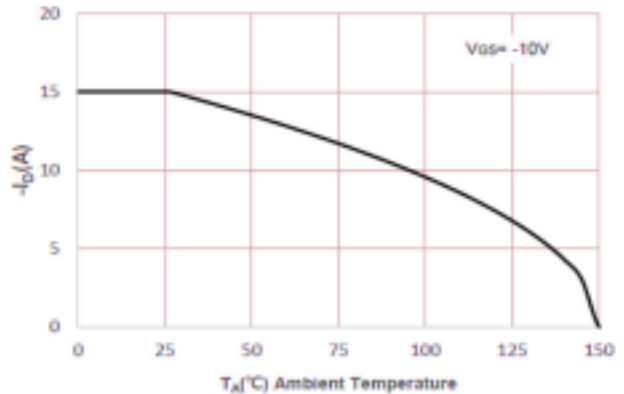


Figure 11: Normalized Maximum Transient Thermal Impedance

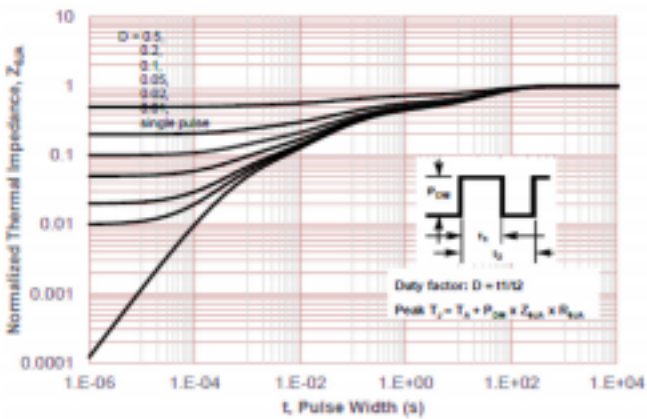
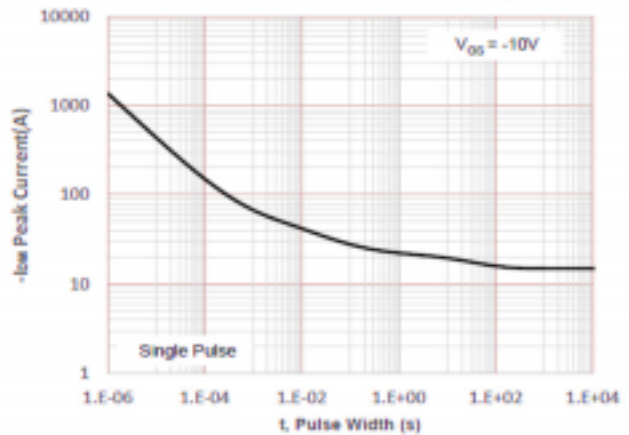
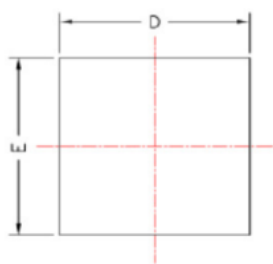


Figure 12: Peak Current Capacity

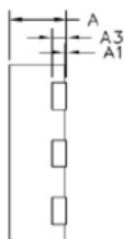


DFN2020-6L Package Information

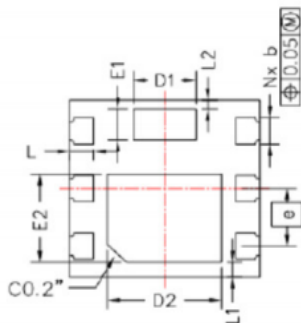
Package Outline



Top View



Side View



Bottom View

SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.750	0.800	0.028	0.030	0.031
A1	---	---	0.050	----	----	0.002
A3	0.195	0.203	0.211	0.008	0.008	0.008
b	0.250	0.300	0.350	0.010	0.012	0.014
e	0.65BSC			0.026 BSC		
D	1.900	2.000	2.100	0.075	0.079	0.083
E	1.900	2.000	2.100	0.075	0.079	0.083
D1	0.560	0.660	0.760	0.022	0.026	0.030
E1	0.250	0.350	0.450	0.010	0.014	0.018
D2	1.100	1.200	1.300	0.043	0.047	0.051
E2	0.900	1.000	1.100	0.035	0.039	0.043
L	0.150	0.250	0.350	0.006	0.010	0.014
L1	0.065	0.165	0.265	0.003	0.006	0.010
L2	0.000	0.100	0.200	0.000	0.004	0.008

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